MONITORING PLAN

PROJECT NO. TE-25
EAST TIMBALIER SEDIMENT RESTORATION

Date: July 15, 1998

Preface

To provide a comprehensive monitoring program for all Terrebonne Basin barrier island restoration projects, an agreement was reached between U.S. Environmental Protection Agency, National Marine Fisheries Service, and Louisiana Department of Natural Resources to combine monitoring survey budgets to use Scanning Hydrographic Operational Airborne Lidar Survey (SHOALS) technology. The SHOALS methods produce a more comprehensive elevational data set for the entire Terrebonne Basin barrier islands, without increasing the project specific surveying costs.

Project Description

The East Timbalier Sediment Project (part 1) is located on East Timbalier Island in Lafourche parish, Louisiana at latitude 29° 4' 00" N and 90° 18' 00" W, on the central portion of the island (figure 1) and is 134 ac (54.2 ha) in size. The island is the western barrier shoreline on the outer edge of the Mississippi River's abandoned Lafourche delta lobe (Morgan 1979; McBride et al. 1992). East Timbalier is about a half mile wide and approximately four miles long and is located at the mouth of Timbalier Bay. It is considered a part of the Bayou Lafourche headland and is directly to the east of Timbalier Island across from Little Pass. East Timbalier Island is bordered by Timbalier Bay directly to the north, the Gulf of Mexico to the south, Little Pass to the west, and Raccoon Pass / Penrod Slip to the east. The remaining areas consist of beach, low dunes, and marsh. *Spartina alterniflora* (smooth cordgrass) is the dominate species of the salt marsh communities with *Spartina patens* (marsh-bog cordgrass) and *Distichlis spicata* (seashore saltgrass) also present. *Avicennia germinans* (black mangrove) is distributed across a large area of the island. Approximately 400 ac (161.9 ha) of the island are vegetated (USDOC, 1993).

East Timbalier acts as an important coastal barrier, reducing the wave energy the marshes potentially experience by lining Timbalier Bay. Barrier islands protect these wetland areas from Gulf of Mexico waves, storm surges, and salt water intrusion (McBride et al. 1992). The habitats provided by the barrier islands are extremely valuable for birds and mammals.

An analysis of wetland loss for the Timbalier basin over the two periods (1956 - 1978 and 1978 - 1990) showed that approximately 80% of marsh losses cannot be attributed to increased salinity (van Heerden et. al. 1993). The general decrease in length of the island over time, from 31,680 ft

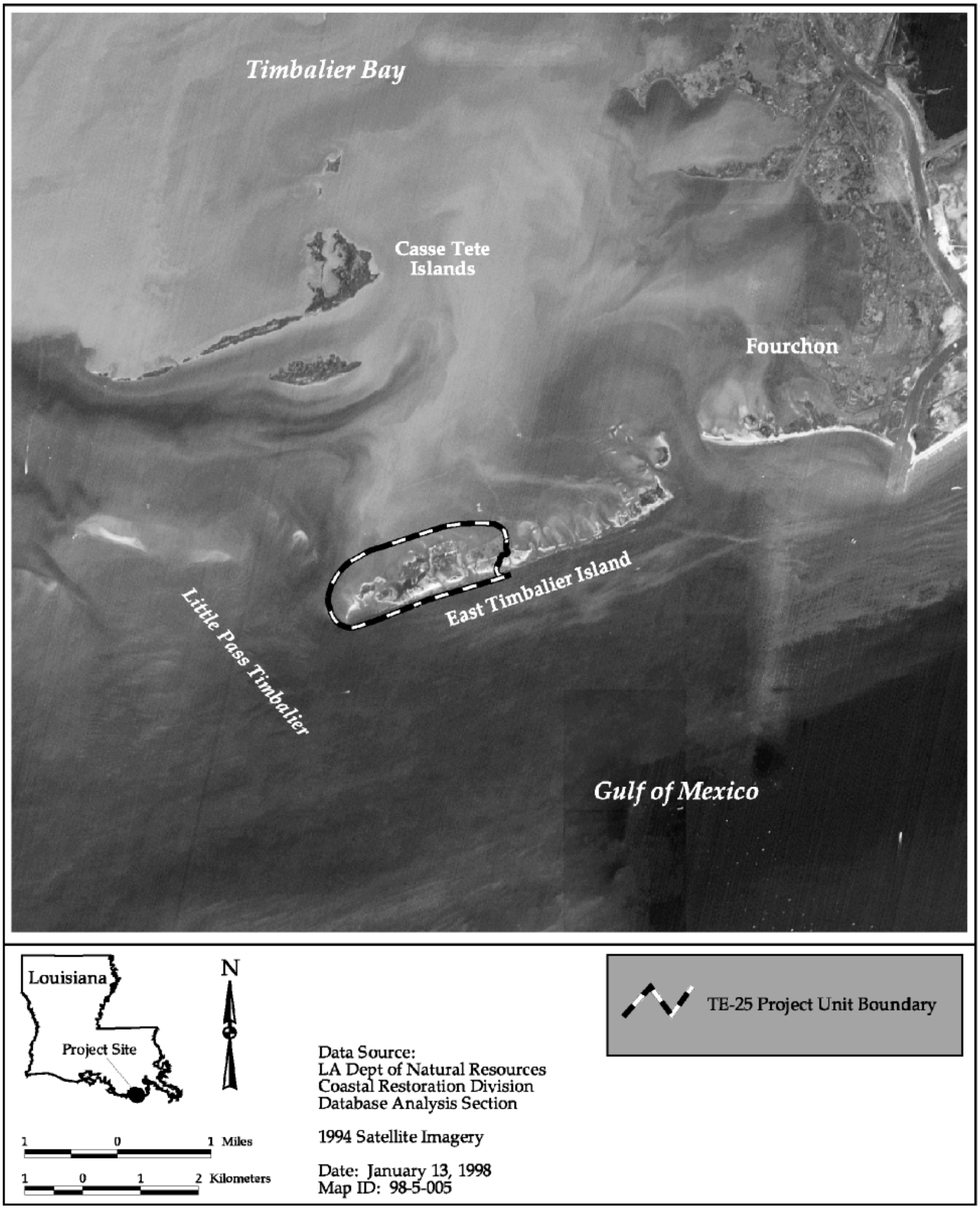

Figure 1. East Timbalier Island Restoration (TE-25) project location.

(9,662.4 m) in 1956 to 24,340 ft (7,423.7 m) in 1990, results in an increase in the width of the associated tidal passes. The consequence of this is that the tidal prism within the bay has increased by at least 70% since 1980 (van Heerden et al. 1993). Increase in tidal prism means a greater area and period of inundation which is now thought to be the dominant cause of wetland loss in Terrebonne Basin. Van Heerden et al. (1993) present evidence that 80% of all wetland loss in the Terrebonne Basin occurred in areas in which there had been no increase in salinity, but an increase in inundation. Van Heerden et. al (1993) predicts that if the barrier islands were restored to their 1880's configuration, the tidal prism would be reduced by 69% and there would be a net increase in wetlands.

East Timbalier Island has experienced extreme shoreline erosion due to the recent extension of existing jetties at Belle Pass just east of the island (Mossa et al. 1985). Sediment supply from its Caminada Neveau headland source has ceased due to the extension of the jetties. The sediment supply was sufficient to maintain and increase the surface area of East Timbalier from 14.9 km (9.25 miles) in 1887 to 11.25 mi(18.1 km) in 1956, despite initial placement of jetties at Belle Pass in 1935, repeated hurricane impacts, and substantial relative sea level rise due to compactional subsidence (McBride et al. 1991). Since then, the jetties have been extended and modified several times. There is now accelerated erosion downdrift of these structures and the island is currently experiencing an average shoreline retreat rates of 75.79 ft (23.1 m) per year (McBride et al. 1991).
A large number of oil and gas facilities exist in the shallow bays behind East Timbalier Island. These facilities are relatively old and were not designed for open sea conditions. They would be extremely vulnerable without the island's protection. It has been predicted that if all the barrier islands were lost, Terrebonne Basin would experience a wetland loss of at least 117,000 ac (4734.1 ha) (van Heerden et al. 1993).

The East Timbalier Sediment Restoration project (part 1) will require an estimated 402,000 cubic yards of borrow material to construct 46.15 ha (114 acres) at a elevation of +0.09 m (2.0 feet) National Geodetic Vertical Datum1929 (NGVD).

Project Objective

The objective is to increase the life expectancy of East Timbalier island by placing dredged material along its shoreline.

Specific Goals

The following goals will contribute to the evaluation of the above objective:

1. Increase the elevation and width of East Timbalier Island using dredged sediments

2. Reduce loss of sediments through the growth of aerially seeded and natural vegetation

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Aerial Photography — Near vertical, color-infrared aerial photography (1:12,000 scale), flown in November 1997, will be acquired from the National Wetlands Research Center (NWRC) as the pre-construction standard for future changes in the island's dimension. The photography will be georectified for land/water ratio using NWRC standard operating procedures (Steyer et al. 1995).

2. Vegetation — Hand planted and naturally colonizing vegetation as well as aerially seeded vegetation, if present, will be monitored by measuring % cover of all species found in approximately 5 - 1m plots [every 200 ft (60.96m)] along 5 transects, one randomly selected from each fifth of the island. The vegetation plot position will be randomly selected, within 100 ft (30.48m) right or left, along the randomly selected elevational transect. Percent cover will be measured by estimating the percentage of the ground area within each plot covered by each species identified. In an area of natural marsh unaffected by project construction, a reference area will be designated for vegetation comparisons. Along two transect lines in the reference area, spaced 1000 ft (304.8 m) apart, approximately 5 to 10 plots (3.3 ft • 3.3 ft; 1m • 1m) will be surveyed for percent cover of identified species. The number of reference plots will be determined by accessibility. The reference area data will be evaluated for validity of comparison to the project area after the year 2000 and a decision will be made as to the need to continue monitoring the reference area. Differential GPS coordinates will be recorded for each vegetation plot. Data will be collected in 2000, 2001, 2003, 2007, and 2016 to correspond with the collection of elevational survey data.

3. Topography — To document both horizontal and vertical change along the constructed area of East Timbalier, transect lines were established at 250 ft (76.20 m) intervals by professional surveyors before construction. Samples were collected every 100 ft (30.48 m) across the island along each transect. Postconstruction surveys will be conducted in October to correspond with vegetation sampling and to avoid disturbance of nesting birds on the island. Beginning in October of 1999, the postconstruction airborne lidar hydrographic surveys will be conducted using the SHOALS system (Lillycrop et al, 1997). The airborne lidar hydrographic survey will collect data along lines the

length of the island. Data collected will be used to develop elevational transect lines. The SHOALS survey will be conducted in October 1999, 2001, 2003, 2007, and 2016.

Anticipated Statistical Tests and Hypotheses

The following hypotheses correspond with the monitoring elements (above) and will be used to evaluate the accomplishment of the project goals (above):

1. Descriptive and summary statistics will be used on both historical data and data from aerial photography collected during preproject and postproject implementation to assess land/water ratios of the island. This analysis will allow for the evaluation of.

   Goal: Increase the elevation and width of East Timbalier Island using dredged sediments.

2. The primary method of analysis for elevation will be to determine differences in mean elevation and width as evaluated by a repeated measures ANOVA that will consider both spatial and temporal variation and interaction. This basic model will determine changes in island elevation, the volume of island sediment, and width of the project area after construction. All original data will be analyzed and transformed (if necessary) to meet the assumptions of ANOVA (e.g. normality). The preproject, time 0 (immediate post-construction), and postconstruction topographical data will be obtained from engineering surveys and postconstruction topographical data will be obtained through SHOALS survey methodology.

   Goal: Increase the elevation and width of East Timbalier Island using dredged sediments.

   Hypothesis A_1:

   H_0: Mean width of the project sediment addition after project implementation at time point i, will not be significantly greater than the mean width at time 0

   H_a: Mean width of the project sediment addition after project implementation at time point i, will be significantly greater than the mean width at time 0

   Hypothesis A_2:

   H_0: Mean height of the project sediment addition after project implementation at time point i, will not be significantly greater than the mean height at time 0

   H_a: Mean height of the project sediment addition after project implementation at time point i, will be significantly greater than the mean height at time 0

3. Analysis of Variance (ANOVA), descriptive, and summary statistics will be used to evaluate vegetative growth (first-year analyses will concentrate on descriptive and summary statistics). Analysis will be based on percent cover of the species present. The ANOVA approach may include terms in the model to adjust for station locations and elevation. If we fail to reject the null hypothesis, we will investigate for negative effects. This ANOVA will allow for the analysis and long-term documentation of vegetative coverage changes on the Isle Derieres from time 0 (immediate post-construction) to the end of the project.

   Goal: Reduce loss of sediments through the growth of aerially seeded and natural vegetation.

   Hypothesis A:

   H_0: Mean vegetation coverage at year i will not be significantly greater than mean vegetation coverage at time 0

   H_a: Mean vegetation coverage at year i will be significantly greater than mean vegetation coverage at time 0

   Hypothesis B:

   H_0: Mean relative abundance of vegetation in the project area at time i will not be greater than mean relative abundance of vegetation in the reference area

   H_a: Mean relative abundance of vegetation in the project area at time i will be greater than mean relative abundance of vegetation in the reference area

Notes

1.	Implementation:	Start Construction:	January 1999
		End Construction:	September 1999
2.	NMFS Point of Contact:	Dr. Teresa McTigue	(318) 482-6630
3.	DNR Project Manager:	David Burkholder	(504) 342-6814
	DNR Monitoring Manager:	Chris Borron	(504) 447-0996
	DNR DAS Assistant:	Chris Cretini	(504) 342-9425

4. The twenty year monitoring plan development and implementation budget for this project is $139,408. Progress reports will be available in September 2000 and September 2002, and comprehensive reports will be available in September 2004, September 2008 and September 2019. These reports will describe the status and effectiveness of the project.

5. References:

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Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson. 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

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